

## SPECIFICATION

## TITLE OF THE INVENTION

## DISC CASE

## 5 BACKGROUND OF THE INVENTION

## Field of the Invention

This invention relates to a disc case capable of enclosing a disc-like recording medium such as an optical disc, and a magneto-optical disc.

## Description of the Related Art

10 Most of the disc-like record media used in a recording and reproducing apparatus have heretofore been enclosed in a disc cartridge and used in order to prevent adhesion of fingerprints, oils and fats, or dust to the disc surface which will have an effect on recording performance. In the DVD-RAM specifications (DVD Specifications for Rewritable Disc, Version 2.1) standardized at DVD Forum, a cartridge enclosing a disc with a diameter of 12 cm (hereinafter referred to as 12 cm disc cartridge) and a cartridge enclosing a disc with a diameter of 15 8 cm (hereinafter referred to as 8 cm disc cartridge) are provided.

20 FIG. 1 is a plan view showing an example of an 8 cm disc cartridge 100 conforming to the above specifications. In FIG. 1, the reference numeral 1 designates a quadrilateral case removably enclosing a disc 2. The case 1 is provided with an opening part 3 for exposing a part of the disc 2 to the outside,

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positioning holes 4 and 5 for regulating the loading position to the recording and reproducing apparatus, a shutter 6 movably mounted on the case 1 to open and close the opening part 3, a disc take-out history detecting sensor hole 7 for detecting the history of taking out the disc 2 from the case 1, a disc cartridge detecting sensor hole 8 for detecting loading of the disc cartridge 100 in installation on the recording and reproducing apparatus, a wrong record preventive detecting hole 9 for preventing wrong recording, a detent 10 concerned with the installation and discharge operation of the disc cartridge 100 to the recording and reproducing apparatus, and a wrong insertion preventing slot 11. The reference numeral 12 designates a disc holder for closing an opening 13 of the case 1 for attaching and removing the disc 2 to form a back wall. The 8 cm disc cartridge 100 is formed to be turned over and inserted/mounted in the recording and reproducing apparatus so that record/reproduce operation is enabled to a both-sided record/reproduce disc.

FIG. 2 is a plan view showing an example of construction of the disc holder 12. The disc holder 12 is provided with an arm 15 having a flange 14 for holding the disc 2, an unlocking lever 17 for unlocking a locking part 16 on a recessed part (not shown) formed in the case 1, an unlock preventing member 18 for preventing unlocking of the unlocking lever 17, and a grip part 19.

In this arrangement, the unlock preventing member 18 is

removable from the disc holder 12. In the condition where the disc 2 is not yet taken out of the case 1, the disc take-out history detecting sensor hole 7 is blocked by the unlock preventing member 18 to be put in the close state, and the movement of the unlocking lever 17 in the direction of releasing the engagement of the locking part 16 with the case 1 is prevented. In the case of taking out the disc 2 from the case 1, first the unlock preventing member 18 is removed from the disc holder 12. Thus, the disc take-out history detecting sensor hole 7 is irreversibly put in the open state (the state showing that the disc was taken out in the past), and the unlocking lever 17 can be moved in the direction of releasing the engagement of the locking part 16 with the case 1. In this state, with the locking lever 17 held from both sides to release the engagement of the locking part 16 with the case 1, the disc holder 12 is drawn out of the case 1, whereby the disc 2 is taken out in the state of being held on the disc holder 12 from the case 1. In storing the disc 2 in the case 1, the disc 2 is held on the disc holder 12, and then the disc holder 12 is inserted into the case 1, or after the disc 2 is inserted into the case 1, the disc holder 12 is inserted into the case 1.

FIG. 3 is a perspective view showing an example of a 12 cm disc cartridge in accordance with the above specifications. The 12 cm disc cartridge 200 also has the components of the same functions as those of the 8 cm disc cartridge, and those components

are designated by the same reference numerals as those of 8 cm disc cartridge. In the 12 cm disc cartridge standards, however, the constitution for taking out the disc 2 from the case 1 is not regulated, and then in FIG. 4, a perspective view shows an example of schematic construction adopted in a cartridge on the market. In FIG. 4, the reference numeral 21 is an opening and closing door for closing the attaching and removing opening 13 for taking out the disc 2 from the case 1, which is rotatably fitted to a pivot 22 mounted on the case 1. The opening and closing door 21 is locked on the case 1 by engagement of the locking part 16 with a recessed part (not shown) formed in the case 1. The reference numeral 23 is an opening preventing member for keeping the opening and closing door 21 in the closed state, which is removably planted on the opening and closing door 21.

In this arrangement, in the condition where the disc 2 is not yet taken out of the case 1, the opening preventing member 23 is inserted to thereby put the disc take-out history detecting sensor hole 7 in the closed state and prevent the opening and closing door 21 from moving in the opening direction.

In the case of taking out the disc 2 from the case 1, first the opening preventing member 23 is removed from the opening and closing door 21. Thus, the disc take-out history detecting sensor hole 7 is irreversibly put in the open state, and the opening and closing door 21 can be moved in the opening direction.

In this state, the engagement of the locking part 16 with the

recessed part (not shown) formed in the case 1 is released to open the opening and closing door 21, so that the disc 2 can be taken out through the attaching and removing opening 13.

The disc 2 is stored in the case 1 by inserting the disc 2 into the case, and then closing the opening and closing the door 21.

In either case of the 8 cm cartridge 100 and 12 cm cartridge 200, as described above, the disc 2 is removably stored in the case 1. The reason for adopting the removable structure is that the disc mounting interchangeability is secured among various apparatus. For example, the disc recorded by the recording and reproducing apparatus for a disc cartridge can be mounted in a reproducing apparatus used by the disc simple body as to reproduce the record. Further, the disc recorded by the recording and reproducing apparatus for an 8 cm disc cartridge can be recorded or reproduced by the recording and reproducing apparatus for 12 cm disc cartridge having an 8 cm disc mounting part.

In the conventional disc cartridge, as described above, adhesion of fingerprints, oils and fats, or dust to the disc surface which will have an effect on recording performance is prevented and simultaneously secured is the convenience that the recorded disc is taken out of the disc cartridge and mounted on another recording and reproducing apparatus or reproducing apparatus to be recorded or reproduced.

## SUMMARY OF THE INVENTION

In the conventional disc cartridge, however, the environment of the stored disc is surrounded with a case, so it is necessary to form the case by at least two, upper and lower pieces. Further, for the reason of needing a shutter for opening and closing an opening part provided in the case, there are limits to simplifying the constitution of the cartridge, facilitating the removal of the disc from the cartridge and reducing the cost of manufacturing the cartridge.

As for error correcting technology, recently the reliability of recording and reproduction has been remarkably improved by the adaptive record control corresponding to the state of the disc surface for reducing data writing failure and enhancing the repeated reproduction of the same portion or error correcting processing for reducing the data wrong recognition. Thus, while it is not yet enough for compensating for deterioration of recording and reproducing performance due to adhesion of fingerprints to the disc surface, as for the adhesion of dust to the disc surface, with the recording density of about 3G bit per 1 inch<sup>2</sup>, in the case of recording an animation by the disc where dust adheres to the surface thereof in the normal storage or operational condition, the deterioration of recording and reproducing performance can be restrained to such a degree that the generation of block noise is not recognized on its reproduced

screen, and further improvements have been expected in future.

The present invention has been made in view of the above circumstances and provides a disc case or a case which may simplify the constitution of the disc case, facilitate the removal of a disc from the disc case, and reduce the cost of manufacturing the disc case.

Further, the invention secures the interchangeability with the existing disc cartridge in the disc case or the case.

According to an aspect of the invention, the disc case enclosing a disc-like recording medium includes an opening part for exposing a part of the disc-like recording medium to the outside and a cantilever-structure elastic deformation part holding the disc-like recording medium and deformed in the direction of thickness of the disc-like recording medium.

According to another aspect of the invention, the disc case has the elastic deformation part deformed to remove the disc-like recording medium.

According to another aspect of the invention, the disc case is used in the same recording and reproducing apparatus as the disc cartridge, the disc cartridge has a first disc-like recording medium and a first quadrangular case removably enclosing the first disc-like recording medium, the first case is provided with a first opening part for exposing a part of the first disc-like recording medium to the outside, a first positioning hole for regulating the loading position to the

recording and reproducing apparatus, a shutter movably mounted on the first case for opening and closing the first opening part, and a first sensor hole showing the take-out history of the first disc-like recording medium, the disc case has a second disc-like recording medium having the substantially same diameter as that of the first disc-like recording medium, and a second case having the substantially same shape as the first case removably enclosing the second disc-like recording medium, the second case is provided with a second opening part for exposing a part of the second disc-like recording medium to the outside, a second positioning hole provided in a portion corresponding to the first positioning hole for regulating the loading position to the recording and reproducing apparatus, a second sensor hole showing the take-out history of the second disc-like recording medium, and a cantilever-structure elastic deformation part deformed in the direction of thickness of the disc for removably enclosing the second disc-like recording medium.

According to another aspect of the invention, a case capable of enclosing a disc-like recording medium includes an opening part for exposing a part of a disc-like recording medium to the outside, and a cantilever-structure elastic deformation part holding the disc-like recording medium and deformed in the direction of thickness of the disc-like recording medium.

In the above case, the elastic deformation part is deformed to get the disc-like recording medium in and out.

## BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the present invention will be described in detail based on the followings, wherein

5        FIG. 1 is a plan view showing an example of an 8 cm DVD-RAM disc cartridge;

      FIG. 2 is a plan view showing the constitution of the 8 cm DVD-RAM disc holder;

      FIG. 3 is a plan view showing an example of a 12 cm DVD-RAM disc cartridge;

      FIG. 4 is a perspective view showing an example of an opening and closing door of the 12 cm DVD-RAM disc cartridge;

      FIG. 5 is a plan view showing the constitution of the surface side of a first embodiment;

      FIG. 6 is a plan view showing the constitution of the back of the first embodiment;

      FIG. 7 is a perspective view of the surface side of a disc case from which a disc is taken out in the first embodiment;

20       FIG. 8 is a perspective view showing an elastic deformation part of the disc case shown in FIG. 8 to an enlarged scale;

      FIG. 9 is a perspective view showing the condition where the elastic deformation part of the disc case is deformed within the range of elasticity to abut on a deformation regulating part;

25       FIG. 10 is a perspective view showing the condition in the course of storing and taking out the disc from and in the

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case in the first embodiment;

FIG. 11 is a perspective view showing the condition of completing taking out the disc from the case in the first embodiment;

5 FIG. 12 is a plan view showing the constitution of the surface side of a second embodiment;

FIG. 13 is a plan view showing the constitution of the back of the second embodiment;

FIG. 14 is a perspective view showing the condition of taking out the disc from the case in the second embodiment;

FIG. 15 is a plan view showing the constitution of the surface side of a third embodiment;

FIG. 16 is a plan view showing the constitution of the back of the third embodiment;

FIG. 17 is a plan view showing the constitution of the surface side of a fourth embodiment; and

FIG. 18 is a plan view showing the constitution of the back of the fourth embodiment.

## 20 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

First main reference numerals and symbols used in the drawings will now be described.

1: case of a disc cartridge 2: disc enclosed in the case  
7: disc take-out history detecting sensor hole 12: disc holder  
25 31: case 32: disc 36: elastic deformation part 37: disc

take-out history detecting sensor 45: guide part 46:  
 deformation regulating part 47: elastic deformation part 54:  
 elastic deformation part 100: 8 cm disc cartridge 200: 12 cm  
 disc cartridge 300: a first embodiment of disc case 400: a second  
 5 embodiment of disc case 500: third embodiment of disc case 600:  
 fourth embodiment of disc case

The embodiments of disc cases according to the invention  
 will now be described by the attached drawings.

FIG. 5 is a plan view of the surface side of the first  
 10 disc case 300, and FIG. 6 is a plan view of the back thereof.  
 In the drawings, the reference numeral 31 is a case integrally  
 formed of plastics such as polycarbonate resin, which has the  
 substantially same outline of the above 8 cm disc cartridge 100.  
 The disc 32 (either one-sided record/reproduce or both-sided  
 record/reproduce) is removably held on the case 31 to constitute  
 the disc case 300.

The case 31 includes an opening part 33 for exposing the  
 disc 32 to the outside, positioning holes 4,5 provided in the  
 8 cm disc cartridge 100 for regulating the loading position to  
 20 the recording and reproducing apparatus, the disc take-out  
 history detecting sensor hole 7, the cartridge detecting sensor  
 hole 8, positioning holes 34 and 35 provided in portions  
 corresponding to a detent 10 and a wrong insertion preventing  
 slot 11, respectively, the disc take-out history detecting sensor  
 25 hole 37, a disc case detecting sensor hole 38a, a detent 40 and

a wrong insertion preventing slot 41.

In this arrangement, the disc take-out history detecting sensor hole 37 is set to the open state, and the information corresponding to the open state is always held therein. This is adopted in consideration of the possibility that in mounting the disc case 300 in the recording and reproducing apparatus, an operator touches the information recorded surface of the disc 32 through the opening part 33 by mistake even if there is no disc take-out history from the case 31.

The reference numeral 36 designates the elastic deformation part for removably holding the disc 32, and the reference numeral 39 designates a fixed flange part for holding the disc 32 in co-operation with the elastic deformation part 36. The disc 32 is regulated from being moved in the direction of thickness by the flange part 39.

The reference numeral 42 is a front end face of the case 31, which has a linear part moving while sliding not to obstruct the movement of a shutter opening and closing mechanism (not shown) provided in the recording and reproducing apparatus when the recording and reproducing apparatus is loaded with the 8 cm disc cartridge 100. The reference numeral 43 is a label area.

FIG. 7 is a perspective view of the surface side of the case 31 from which the disc 32 is taken out. In the drawing, the reference numeral 44 is a disc accommodating part for accommodating the disc 32. FIG. 8 is a perspective view of a

part of the elastic deformation part 36 in FIG. 7 to an enlarged scale. The elastic deformation part 36 has a cantilever structure deformable in the direction of thickness of the disc 32 enclosed in the case 31, and it is provided with a guide part 45 having a slant face at the forward end part thereof, a part of which always enters the thickness of the case 31, whereby in the case of forming the forward end part of the cantilever to project over the top face of the case 31, in mounting or removing to and from the recording and reproducing apparatus, the forward end part is prevented from colliding with a member of the apparatus side to interrupt the mounting or removing operation. The guide part 45 also serves as a radial position regulating wall for regulating the radial position of the disc 32, and the disc 32 enclosed in the case 31 is regulated in the radial position by the radial position regulating wall. The lower surface of the cantilever acts as a height direction regulating wall for the disc 32 to thereby regulate the position in the direction of height. Though the guide part 45 is provided with a function of the radial position regulating wall in the present embodiment, the radial position regulating wall may be constructed separately from the guide part 45. The reference numeral 46 is a deformation regulating part for regulating the deformation of the elastic deformation part 36, which abuts on the elastic deformation part 36 within the range of elastic deformation to prevent the elastic deformation part 36 from deforming beyond the elastic deformation

range when the elastic deformation part 36 is deformed in the direction of thickness of the disc 32 enclosed in the case 31. FIG. 9 is a perspective view showing the condition where the elastic deformation part 36 is deformed within the range of elasticity to abut on the deformation regulating part 46. In the drawing, the disc 32 causing the elastic deformation part 36 to be deformed is omitted for clearly showing the above abutting state. It is known from FIGS. 8 and 9 that the opposite part of the elastic deformation part 36 is opened like a window. This structure will produce the effect of easily making a metal mold for manufacturing a case having the elastic deformation part.

FIG. 10 is a perspective view showing the condition in the course of taking out the disc 32 from the case 31 or storing the disc 32 in the case 31. When an operator holds the disc 32 (the operator's hand is not shown) and lifts the disc 32 from the condition of Fig. 5, the elastic deformation part 36 of the case 31 is deformed in the direction of thickness of the disc (upward), so that a part of the disc 32 is out of the thickness of the case 31. When the disc 32 is drawn out in the direction of an arrow A in FIG. 5 from the above condition, it enters the condition of FIG. 10. The disc 32 is further drawn out in the direction of the arrow A, thereby separating the disc 32 from the case 31 to complete taking out. FIG. 11 is a perspective view showing the condition of completing taking out.

In the case of storing the disc 32 in the case 31, the

disc 32 is stored in the disc accommodating part 44 while hiding under the elastic deformation part 36, which results in completion of storing of FIG. 5 through the condition of Fig. 10.

The flexural strength of the elastic deformation part 36 will now be described. In order to take out the disc 32 from the present embodiment of the case 31, it is necessary that the elastic deformation part 36 is deformed 1 mm in the direction of thickness. When the above deformation amount is obtained with the force of about 0.5 to 0.6 N, the disc is easily put in and out, so it is favorable in view of operation. That is, preferably the elastic deformation part is designed so that the Mises stress is 22 MPa (load of 0.55 N). This value has enough allowance as compared with the Mises stress (80 to 90 MPa) taken as general flexural strength. It is desirable that the fixed flange part 39 will not be elastically deformed even if the same force is applied thereto. It is considered that when the elastic deformation amount is under 0.002 mm with the application of force of about 0.5 to 0.6 N, the above requirements can be satisfied. That is, it is preferable to design so that the Mises stress of the fixed flange part 39 is equal to or smaller than 1.5 MPa (load of 0.55 N).

As described above, the case 31 has the substantially same outline as the 8 cm disc cartridge 100, so that it can be reversed and inserted/mounted in the recording and reproducing apparatus.

That is, in mounting the both-sided record/reproduce disc on

the case 31 to be used, it can be reversed and inserted/mounted in the recording and reproducing apparatus, whereby record/reproduce operation can be performed for the recording/reproducing surface on the opposite side without taking out the disc from the case 31.

A second embodiment of the invention will now be described. FIG. 12 is a plan view of the surface side of a second disc case 400, and FIG. 13 is a plan view of the back thereof. In the drawings, the components having the same functions as those of the first embodiment of the disc case 300 shown in FIGS. 5 and 6 are designated by the same reference numerals, and the description is omitted. The difference between the second embodiment and the first embodiment is the constitution of the elastic deformation part 47 for removably holding the disc 32. The elastic deformation part 47 is elastically deformed in the directions of arrows C and D by moving the enclosed disc 32 in the direction of an arrow B by an operator. A flange 48 mounted on the elastic deformation part 47 regulates the position in the direction of height of the disc 32, and a cylindrical part 49 mounted on the elastic deformation part 47 regulates the radial position thereof. In this arrangement, being deformed in the directions of the arrows C and D or in the opposite directions to the arrows C and D, the elastic deformation part 47 abuts on regulating walls 50 and 51, whereby the elastic deformation part 47 is prevented from being deformed beyond the range of

elasticity.

FIG. 14 shows the process of taking out the disc 32 from the case 31 in the second embodiment. The disc 32 held by the operator (the operator's hand is not shown) is moved to abut on a raised part of a disc accommodating part 44 while being pressed to the elastic deformation part 47 to apply bending deformation in the directions of the arrows C and D shown in FIG. 1. When the disc 32 is lifted upward as shown in FIG. 14(b), the disc 32 gets over the fixed flange part 39. The disc 32 is moved from this state in the opposite direction to the arrow B shown in FIG. 12, whereby the disc 32 is separated from the elastic deformation part 47 as well to be taken out of the case 31 (FIG. 14(c)).

In the case of storing the disc 32 in the case 31, the disc 32 is inserted between the flange 48 of the elastic deformation part 47 and the disc accommodating part 44. The disc 32 is moved from this state in the direction of the arrow B to abut on the raised part of the disc accommodating part 44 while being pressed to the elastic deformation part 47 to apply bending deformation in the directions of the arrows C and D. The disc 32 is pushed downward from this state below the fixed flange 39. When the energizing force in the direction of the arrow B applied to the disc 32 is removed, the disc 32 is moved to the opposite side to the arrow B by the elastic returning force of the elastic deformation part 47 to enter below the fixed

flange 39. Thus, storing is completed.

In the second embodiment, as described above, two steps of operation for deforming the elastic deformation part and lifting (pushing down) the disc are required for taking out or storing the disc 32, so that the disc 32 can be held more surely as compared with the first embodiment in which the disc is taken out or stored by one step of operation.

A third embodiment will now be described. FIG. 15 is a plan view of the surface side of a third disc case 500, and FIG. 16 is a plan view of the back. In FIGS. 15 and 16, the components having the same functions as those of the first embodiment of the disc case 300 shown in FIGS. 5 and 6 are designated by the same reference numerals, and the description is omitted. The difference between the third embodiment and the second embodiment is the constitution of the elastic deformation part 54 for removably holding the disc 32. The elastic deformation part 54 is elastically deformed in the direction of an arrow E by moving the enclosed disc 32 by the operator. A flange 55 mounted on the elastic deformation part 54 regulates the position in the direction of height of the disc 32. Being deformed in the direction of the arrow E or in the opposite direction to the arrow E, the elastic deformation part 54 abuts on regulating walls 52 and 53 provided on the case 31 within the range of elasticity, whereby the elastic deformation part 54 is prevented from being deformed beyond the range of elasticity.

Also in the third embodiment, the disc 32 is taken out and stored by conducting the operation similar to that of the second embodiment (FIG. 14).

5 A fourth embodiment will now be described. FIG. 17 is a plan view of the surface side of the disc case 600, and FIG. 18 is a plan view of the back. In FIGS. 17 and 18, the components having the same functions as those of the first embodiment of the disc case 300 shown in FIGS. 5 and 6 are designated by the same reference numerals, and the description is omitted. The difference between the fourth embodiment and the first embodiment is the constitution of a front edge 42 of the case. In the fourth embodiment of the disc case 600, the front edge 42 of the case is formed of material easy to elastically deform, so that after the case is elastically deformed in the directions of arrows F and G, the enclosed disc 32 is moved by the operator to take out and store the disc 32.

10 In the above embodiments, the disc 32 stored in the case 31 may be of a type in which information is recorded on one side of the disc and/or information is reproduced from one side of the disc, or a type in which information is recorded on both sides of the disc and/or information is reproduced from both sides of the disc. Corresponding to the above conditions, the case 31 is constructed to be mounted on the recording and reproducing apparatus so that the information recording surface of the enclosed disc 32 to be recorded or reproduced is opposite

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to an optical head in the recording and reproducing apparatus. The case 31, as described above, has the substantially same outline as the 8 cm disc cartridge 100. To be concrete, the case 31 shown in FIG. 5 has a width W of about 89 mm, and a depth D of about 91 mm, which are respectively about 1.11 and 1.14 times as large as the diameter  $\phi$  about 80 mm of the enclosed disc 32, and both of which are 1.2 times or less so that the case is small-sized. In addition, when the diameter  $\phi$  of the disc 32 is set to 80 mm and the thickness thereof is set to about 1.2 mm, and the type is selected from DVD-RAM, DVD-R, DVD-RW, and DVD + RW, it is possible to construct a system enhanced in disc mounting interchangeability between the apparatus.

Though the case 31 is constructed to be serviceable to the same recording and reproducing apparatus as the 8 cm disc cartridge 100 in the embodiments, it may be constructed to be serviceable to the same recording and reproducing apparatus as the 12 cm disc cartridge 200. The case is not limited to the construction usable in the same recording and reproducing apparatus as the disc cartridge, and only the disc case of the invention is constructed to be serviceable to the recording and reproducing apparatus, which will cause no problem. In the case of constructing the case serviceable to the same recording and reproducing apparatus as the 12 cm disc cartridge 200, it is suitable that the outline of the case 31 is made substantially equal to that of the 12 cm disc cartridge, the diameter  $\phi$  of

the disc 32 to be enclosed is about 120 mm, the thickness thereof is about 1.2 mm and the type is selected from DVD-RAM, DVD-R, DVD-RW, and DVD + RW. In the case of constructing the disc case 300 only to be serviceable to the recording and reproducing apparatus, the outline of the case 31 and the diameter and thickness of the enclosed disc 32 may be arbitrarily set, and for reduction of size, however, the outline dimension of at least one portion of the case 31 in the radial direction of the disc (outline dimensions corresponding to W or D in FIG. 5) is set 1.2 times or less as larger as the diameter  $\phi$  of the enclosed disc 32.

According to the invention, as described above, it is possible to obtain the disc case simple in structure, and capable of facilitating taking out the disc. Since the disc case has interchangeability with the existing disc cartridge, it can be mounted on the existing recording and reproducing apparatus.